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CANADIAN FORCES FLIGHT TRIAL OF INDIVIDUALLY MOLDED FIBREGLASS LUMBAR SUPPORTS

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ABSTRACT

Individually molded fibreglass lumbar supports may be useful in alleviating backache in aircrew members. This paper concludes a flying trial of 13 FW and 25 RW aircrew which was first given as a preliminary report to the 1985 ASMA annual meeting. Each aircrew member had been referred with a complaint of recurrent backache in their particular flying environment. Thirty-eight aircrew members (36 pilots, one navigator and one AESO) were individually fitted, flew from five to 300 hours wearing the lumbar support, then completed a pre- and post-support subjective evaluation. Prior to use of the lumbar support, most subjects experienced frequent or occasional backache of varied duration. Only 14% of trial aircrew experieced backpain during every flight. Trial participants indicated that the lumbar supports were easy to handle and position in the aircraft with only occasional shifting during flight. Most aircrew were not distracted, and all reported that flying performance was not affected while lumbar supports were worn. This two-year study showed that the lumbar support was beneficial for fatigue relief in 69% of FW subjects and 32% of RW subjects. Seventy-seven per cent of FW subjects and 36% of RW subjects reported considerably less backache due to wearing the lumbar support. Complete alleviation of backpain was reported by three participants. It increased sitting comfort in 85% of FW subjects and 40% of RW subjects. It is speculated that FW aircrew are able to sit upright more consistently than RW aircrew, who rarely do while using aircraft controls, and this upright posture allows the lumbar support to provide its benefit.

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INTRODUCTION

Back pain, especially lumbar pain as a result of an individual's occupation, has been a problem for mankind since recorded history. It is still unknown why some people are able to go through their entire working life without suffering from back discomfort, while others, under the same conditions, continue to suffer repeated attacks. The problem of backache, its probable causes and possible solutions have been well documented by several authors and agencies, with the most recent overview of the literature about helicopter aircrew being provided by Bowden (1). While the problem appears to be most common in rotary wing aircrew, it extends across the fixed wing community as documented in the excellent AGARD conference proceeding on backache and back discomfort published in June 1986 (2).

The complaint of backache is common among aircrew of all types of aircraft, and has been accepted by them for some time. They are often unable to obtain relief by normal medical ministrations and the fear of "grounding" may foster the acceptance of back pain as an occupational discomfort for many. Description of backache among aircrew generally involves pain of the lower back, usually without radiation, that occurs mostly in flight, and often persists after landing for a variable period of time.

Such back pain is exacerbated in many cases by the poor posture that pilots are required to assume while flying for extended periods. The seat often lacks adequate lumbar support and adjustability. Back-pack, parachute, seat restraint systems and inadequate head clearance add stress to the back. Poor design and location of aircraft controls require awkward positions to be maintained for the entire flight. A position which may initially be comfortable can become painful if no opportunity to relieve the constant muscle tension is provided. Other etiological factors include vibration, thermal stress (i.e. cold drafts), weight of head-mounted life support equipment and the natural tension induced by involvement in a difficult task.

While improvements in the design of cockpit, seats and aircraft controls may improve aircrew comfort and effectively prevent such back pain among aircrew, it is not a cost effective solution for current, in-service aircraft. Back supports, which restore the normal lordosis in sitting posture, may offer a less costly method of reducing back pain.

Accordingly, the Medical Life Support Division (MLSD) of the Defence and Civil Institute of Environmental Medicine (DCIEM) undertook to determine the usefulness of individually moulded fibreglass lumbar supports in the alleviation of postural back pain among Canadian Forces (CF) aircrew. A preliminary report of CF aircrew experience with the molded lumbar support was given as a poster session at the Annual Scientific Meeting of the Aerospace Medical Association at Nashville, April 1986. The results of this small survey encouraged us to carry on producing these supports for a larger study group and this paper provides the results of this larger study.

METHODS

Patient Referral

An aircrew member experiencing back pain during flying duties first reported to the Base Flight Surgeon. The Flight Surgeon examined the patient to make the determination that the backache was postural in origin, not owing to underlying pathology, and then referred the aircrew member to MLSD of DCIEM for a fitting appointment. Each referred aircrew member was fitted following final discussion of case history, trial purpose and conduct with the MLSD Medical Officer.

Lumbar Support Fitting

Dr. J.G. Fitzgerald (3) first described a rapid method of casting body contours using an air-tight sheath containing minute spheres of polyvinyl chloride or polystyrene. This system was adapted for use at this Instituto following the publication of the RAF IAM Training Memorandum No. 32 on the procedure for the manufacture of individually molded lumbar supports (4).

Each referred patient was seated on a specially constructed wooden chair containing a vertically-divided polystyrene bag shown in Figure 1. The patient was instructed to sit back in the seat, lean forward and then sit erect three times. This forced the patient back into the form and resulted in a correct sitting posture. With the patient sitting erect, the technician formed the sides to give additional support (Figure 2), and the bag containing the polystyrene spheres was evacuated with a small vacuum pump. The vacuum locked the polystyrene spheres, so that when the patient arose from the seat, the form retained an accurate imprint of the patient's lumbar curve (Figure 3). The patient was then given the questionnaire; the finished lumbar support was shipped to the appropriate Base Flight Surgeon at a later date. The fitting process was usually completed in less than one hour.

Lumbar Support Manufacture

Readers are referred to the original RAF documents (3, 4) for full details; however, a brief description of lumbar support manufacture follows:

a. two layers of glass cloth were placed on the contoured form for padding to remove some of the ridges caused by the channels in the form (Figure 4);

b. aluminum foil was then placed over the glass padding and kept as smooth as possible, with the shiny side down, to prevent it from sticking to the fibreglass (Figure 5);

c. fibreglass resin was applied to six layers of cloth, one layer at a time, and left to dry for 24 hours (Figure 6);

d. the critical area of the support was located and measured with the maximum width for aircrew being 12 inches (Figure 7);

e. the support was then cut out using a band saw;

f. the back was sanded in preparation for the veil cloth;

g. all lettering was located on the back of the support, covered with two layers of veil cloth and resin, and allowed to dry for 24 hours (Figure 8);

h. the support was trimmed with a band saw; slits were cut on both sides to receive the webbing, centered from top to bottom and located one inch from each outer edge; waist length webbing (plus six inches) with hook and pile velcro at either end was attached to the support with epoxy glue, and allowed to dry for 24 hours (Figure 9); and

j. a one half inch wide area was sanded around the outer back edge of the support; three coats of contact cement was applied to both the support and the corresponding area of covering material; a half inch thick foam padding was spot-glued to the front of the support and the cloth covering glued in place. The cloth was trimmed, and an edge sealer applied to prevent fraying of the finished support (Figures 10 and 11).

Instructions for Use

The patient was encouraged to use the support during all flying activities and preferably in all other situations (i.e. car or office) which aggravate the backache. It was stressed that the support was individually molded and could not be used by another individual. When used in ejection seat aircraft, the support was to be worn underneath the flying coverall to prevent possible flailing injury during ejection. The device has not been worn in an aircraft requiring a G-suit.

Questionnaire

Each aircrew member was requested to complete the questionnaire after two months of use. The questionnaire was designed to evaluate the handling and maintenance of the support, its effect on back pain, sitting comfort, fatigue and aircrew performance. The Medical Officer was also requested to complete a brief form giving his opinion about the effectiveness of the lumbar support for the patient's condition, and in particular fully describing any reasons that the lumbar support was considered unsatisfactory. A copy of the instructions and questionnaire is included as Annex A.

Aircrew Participants

A total of 50 aircrew have been fitted to date. Thirty-eight (or 76%) have completed the trial and questionnaire. This is considered a good return given the voluntary nature of the questionnaire and the mobility of the aircrew. Thirty-six of the participants were aircraft pilots and one navigator and one Airborne Electronics Sensor Operator (AESO) of the CH124 Sea King helicopter participated in the trial. Table 1 indicates the number of aircrew participants by aircraft type.

Table 1. Aircrew Trial Participants by Aircraft Type

Number of Aircrew	Aircraft Type	Specific Aircraft
13	Fixed Wing	CC130 Hercules (5)
		CT114 Tutor (3)
		CC137 Boeing 707 (1)
		CC138 Twin Otter (1)
		CC115 Buffalo (1)
		CP140 Aurora (1)
		CT134A Musketeer (1)
	Rotary Wing	CH136 Kiowa (6)
		CH124A Sea King (5)
		CH135 Twin Huey (3)
		CH118 Single Huey (3)
		CH113 Labrador (3)
		CH139 Jet Ranger (2)
		CH147 Chinook (2)
		Gazelle (1)

RESULTS

Questionnaire results are indicated in Tables 2 through 11 which follow and Figures 12 to 14. All trial aircrew reported that the lumbar support did not affect flying performance or their ability to control the aircraft.

Table 2. Frequency of Backache Experienced by Trial Participants Prior to Issue of Support

Frequency of Backache Reported	Number of Aircrew Responses					
	Fixed Wing		Rotary Wing		All Participants	
Every flight	1	(8%)	4	(17%)	5	(14%)
Frequently	6	(46%)	8	(33%)	14	(38%)
Occasionally	6	(46%)	9	(38%)	15	(41%)
Rare	-		3	(13%)	3	(8%)
No response			1			

Table 3. Duration of Backache Experienced by Trial Participants Prior to Issue of Support

Duration of Backache Reported	Number of Aircrew Responses					
	Fixed Wing		Rotary Wing		All Participants	
Longer than 1 day after sortie	3	(23%)	2	(8%)	5	(13%)
All day after sortie	1	(8%)	6	(24%)	7	(18%)
Up to 4 hrs after sortie	7	(54%)	8	(32%)	15	(40%)
During sortie only	2	(15%)	9	(36%)	11	(29%)

Table 4. Use of Lumbar Supports by Trial Participants During Flight

Questionnaire Item	Fixed Wing	Rotary Wing	All Participants
Hours of flying since support issued	2358 hrs	3428 hrs	5786 hrs
Hours of flying while wearing support	1857 hrs	1475 hrs	3332 hrs
Percent of flight time support worn since issue	79%	43%	58%

Table 5. Ease of Handling/Maintaining Lumbar Support

Response to Ease of Handling/Maintaining Support	Number of Aircrew Responses					
	Fixed Wing		Rotary Wing		All Participants	
No bother at all	6	(46%)	6	(24%)	12	(32%)
No bother once used to it	3	(23%)	2	(8%)	5	(13%)
Nuisance at first	2	(15%)	15	(60%)	17	(45%)
Nuisance all the time	2	(15%)	2	(8%)	4	(11%)

Table 6. Ease of Positioning Lumbar Support in Aircraft

Response to Ease of Positioning Support in Aircraft	Number of Aircrew Responses					
	Fixed Wing		Rotary Wing		All Participants	
No time at all required	10	(77%)	17	(68%)	27	(71%)
One min. or more "	3	(23%)	8	(32%)	11	(29%)
Far too much time "	-		-		-	

Table 7. Shifting of Lumber Support During Flight

Reported Shifting of Lumbar Support in Flight	Number of Aircrew Responses					
	Fixed Wing		Rotary Wing		All Participants	
Did not shift	3	(23%)	9	(36%)	12	(32%)
Little shift occasionally	9	(69%)	15	(60%)	24	(63%)
Shifted considerably	1	(8%)	1	(4%)	2	(5%)

Table 8. Awareness of Lumber Support During Flight

Reported Awareness of Lumbar support During Flight	Number of Aircrew Responses					
	Fixed Wing		Rotary Wing		All Participants	
Unaware of support	4	(31%)	6	(24%)	10	(26%)
Occasionally aware	8	(62%)	15	(60%)	23	(61%)
Aware to distraction	1	(8%)	4	(16%)	5	(13%)

Table 9. Sitting Comfort During Flight While Wearing Lumbar Support

Rated Effect of Support on Sitting Comfort	Number of Aircrew Responses					
	Fixed Wing		Rotary Wing		All Participants	
Greatly improved	4	(31%)	1	(4%)	5	(13%)
Improved	7	(54%)	9	(36%)	16	(42%)
Unchanged	-		9	(36%)	9	(24%)
Reduced	2	(15%)	4	(16%)	6	(16%)
Greatly reduced	-		2	(8%)	2	(5%)

Table 10. Effect of Wearing Lumbar Support on Backache/Backpain

Rated Effect of Support On Backache	Number of Aircrew Responses					
	Fixed Wing		Rotary Wing		All Participants	
Disappeared entirely	2	(15%)	1	(4%)	3	(8%)
Considerably less	10	(77%)	9	(36%)	19	(50%)
Present as before	1	(8%)	11	(44%)	12	(32%)
Worse	-		3	(12%)	3	(8%)
Much worse	-		1	(4%)	1	(3%)

Table 11. Effect of Wearing Lumbar Support on Post-Mission Fatigue

Rated Effect of Support on Post-Mission Fatigue	Number of Aircrew Responses					
	Fixed Wing		Rotary Wing		All Participants	
Less than usual	9	(69%)	8	(32%)	17	(45%)
Same as usual	4	(31%)	13	(52%)	17	(45%)
More than usual	-		4	(16%)	4	(11%)

DISCUSSION

Most volunteers (67%) for this trial were rotary wing aircrew. This supports reports that backache is more prevalent for rotary wing than for fixed wing aircrew. It is possible, however, that fewer fixed wing aircrew were aware of this trial or were available for lumbar support fitting. Flight Surgeon awareness may also be a factor.

The number of trial volunteers from specific aircraft types gives an indication of the nature of the problem in certain flying environments. Five CC130 (Hercules) pilots were referred for fitting. Thus, it appears that length of mission affects susceptibility to backache. This supports findings reported by Bowden (1). A higher incidence of backpain in the Kiowa helicopter is also evident by the number of pilot referrals. This may be attributed to cramped cockpit conditions and extremely poor seat design and adjustability.

Fitzgerald (5) first reported in 1971 that 13% of RAF pilots, aged between 20 and 50, experienced backache or backpain each time they flew, and 22% experienced in-flight backache or backpain at least once during a normal week's flying. As indicated at Table 2, results of this study are similar, with 14% of participants experiencing backpain during each flight. Most subjects (79%) reported frequent or occasional backache. The high frequencies reported by trial participants was entirely expected given the methods of subject selection previously outlined. Similarly, few of the trial subjects reported only rare occurrence of backache.

As indicated at Table 3, duration of aircrew backache varies; the pain may cease immediately following flight or endure for more than 24 hours. Most subjects, both fixed and rotary wing (69% and 68% respectively), experienced backpain during the sortie or up to only four hours afterward. It has been suggested (Shanahan, et al, as cited in Bowden [1]), that backpain sufferers among helicopter aircrew may be divided into two groups: a small group that suffers chronic pain similar to the idiopathic low back pain of the general population, and a larger one that experiences short term pain associated with flight. Trial results indicate that this may also be the case for fixed wing aircrew. Both groups, however, reported similar success with use of the lumbar support.

Lumbar supports were worn for a total of 3,332 flying hours in various aircraft. The percent of flight time that the lumbar support was worn since issue was calculated, indicating compliance. Fixed wing aircrew wore lumbar supports for 79% of their flying hours, while rotary wing aircrew wore them for only 43% of their flying hours. This was the first

indication that the rotary wing aircrew found it less useful.

Most subjects found the support to be easy to handle, maintain, position in the aircraft and coordinate with other life support equipment. Only four subjects felt that looking after this additional piece of personal equipment was a nuisance all the time. Two of these pilots (of CH136 and CT114) commented that the support was awkward to use during flight, but considered beneficial and easy to use for non-flying activities such as driving or working at a desk. The requirement to don the support under personal flight equipment and clothing, cramped cockpits, and mobility necessary during flying operations maybe factors which influence the lumbar support ease of handling, use in flight and positioning.

Once properly positioned, the support may shift slightly, on occasion, but all participants reported that aircraft control was not affected. Few aircrew reported being distracted by wearing the support; most participants were only occasionally aware, or totally unaware of the support during flight. Suggested modifications to the design of the support included a reduction in support width, lengthening of hook and pile closures for improved adjustability, and a more ventile covering material for the support. These proposed modifications will be investigated.

Sitting comfort during flight, while using the support, was improved for the majority (85%) of fixed wing aircrew, but for less than half (40%) of rotary wing aircrew. While a reduction in sitting comfort was experienced by 21% of the aircrew, some pilots felt that this was only the case during long flights. The majority of fixed wing and many rotary wing aircrew reported considerably less backache and less post mission fatigue than usual owing to wearing the lumbar support. With the high incidence of backache in the general population, and the vulnerability of the human spine, complete elimination of backpain was not expected (although it was reported by three subjects). It is unrealistic to expect this, or any improvement, in all subjects.

Clearly, the data shows that fixed wing aircrew benefit to a greater extent than do rotary wing aircrew. Nevertheless, even a 40% improvement in sitting comfort, pain reduction and post flight fatigue is a worthwhile goal for the helicopter crews, even if these benefits are received only when not at the controls (in dual pilot aircraft) or for non-flying activities.

Results reported by the two non-pilot participants in this study indicate that the lumbar support provided no benefit. These results are unexpected given that these crew members experienced mission-related backache of short duration; they are not required to maintain a forward-leaning posture, and they are able to adjust their posture to minimize fatigue in the performance of their duties. Both participants reported that the lumbar support was easy to handle and position, did not shift during flight, and was not a source of distraction. Perhaps cramped work space and the need for mobility in the aircraft contributed to the lack of success for their support. Only expansion of the number of non-pilot participants in various aircraft will clarify these discrepancies.

Results by Fitzgerald (6) on the use of 200 lumbar supports showed that 50% of the users were symptom free and 31% experienced marked improvement. Reader (2) reported on a lumbar support programme in which 85 supports were manufactured and 31 questionnaires returned. His results were also considerably higher than those reported in this trial, with sitting comfort improved in 91%, elimination of backache in 32%, and considerably less backache experienced by 65% of participants. In the latter trial, however, over half of the trial participants were fixed wing aircrew. Expansion of our trial population may also result in a higher proportion of backache relief. The RAF continue to use the lumbar support in both fixed and rotary wing aircraft. Helicopter pilots are reported to receive considerable relief, particularly in the case of the Allouette, that has an uncomfortable seat and a high percentage of aircrew back complaints.

The unique posture required of helicopter pilots because of positioning of the aircraft controls, coupled with the requirement for constant operation of these controls, may be the real reason for the differences in results between aircraft types. For those helicopter pilots who must lean forward in order to reach the collective in its lower position, the lumbar support may be of limited value. However, the lumbar support enables some shorter pilots to overcome the lack of adjustment in some seats (i.e. Kiowa), and assume a more forward seated position. This may reduce the need to lean forward to reach the controls. Thus, the direct lumbar support provided may only be secondary to the change in posture it allows. If this lumbar support is brought into general use, the resultant increased data collection will clarify these findings and continue to differentiate lumbar support effectiveness between aircraft types.

CONCLUSIONS

This study has shown that the fibreglass lumbar supports were well accepted by aircrew. The supports positively affected post-mission fatigue, increased sitting comfort and reduced back pain in 90% of fixed wing subjects and in 40% of rotary wing subjects. Complete alleviation of back pain was reported by three subjects in each of the two categories.

There exists, in the flying community, a limited ability to improve the sitting comfort of our aircrew during flight. Many of our aircraft types have been flying for 20 or more years and it is unlikely that a major modification of the cockpit is justified. In some cases (i.e. the Kiowa) the available cockpit space makes any significant modification to the seat virtually impossible. This custom-molded fibreglass lumbar support has the potential to improve the working life of most of the fixed wing aircrew and a smaller percent of the rotary wing aircrew who request it, and it should be included as an optional piece of life support equipment. The lumbar support manufacturing process, however, is labour-intensive and requires that a special area, that includes a good exhaust air system for the use of fibreglass, be set aside for construction. Consideration must be given to the optimum method of producing this support for our aircrew. While it makes sense to produce this support in one facility, to cut down on the inconvenience at Safety Systems Section, this must be balanced by the additional inconvenience of transporting the aircrew member to the

designated base. The MLSD of this Institute did produce the 50 lumbar supports used in this trial, but should not continue to be regarded as the sole source of these supports. It is recommended that one base be designated, perhaps in each geographical region, to produce the lumbar supports for the aircrew in that region.

RECOMMENDATIONS

The individually molded fibreglass lumbar supports should become an optional item of life support equipment for both fixed and rotary wing aircrew who are experiencing back discomfort in flight.

The Flight Surgeon on each base should continue to be the initial referral agent.

A decision must be taken by the Headquarters involved concerning the location of manufacture of these supports.

ACKNOWLEDGEMENTS

Special recognition is given to J.C. Steffler, G.A. Yuill and A.N. MacLeod, J.G.Y. Lefebvre, R.C. Chatzissavas, J.H. Morrison and S. Remus for the construction of the supports during the period of this study.

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Figure 1. Fitting chair showing vertically divided polystyrene bag and vacuum pump

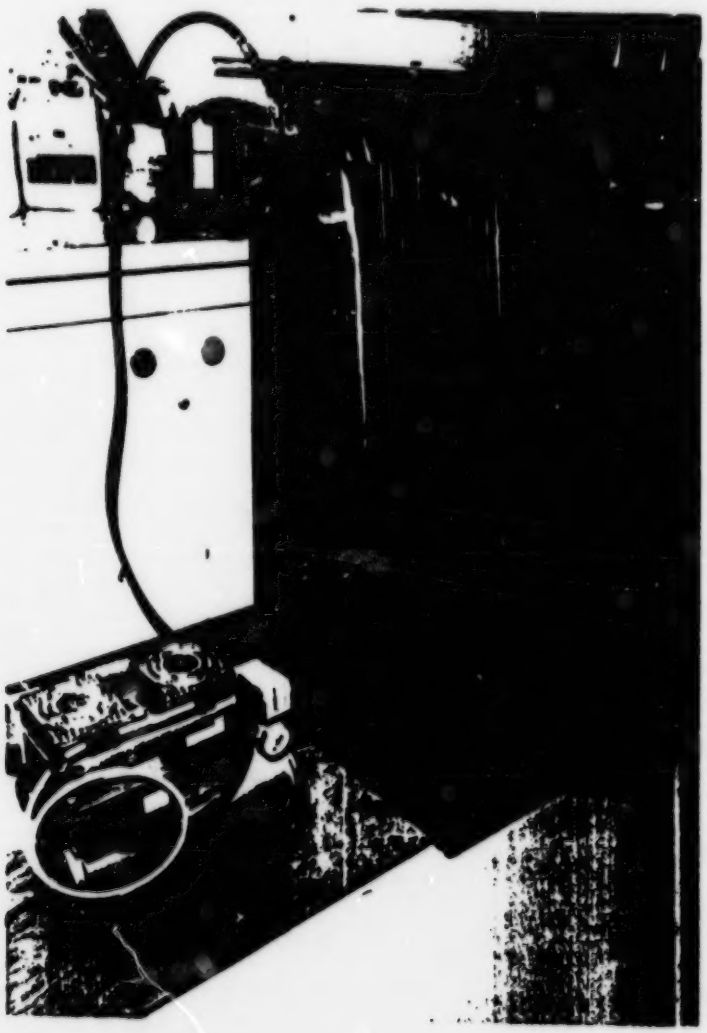


Figure 2. Lumbar contours are cast using polystyrene spheres in a flexible container. The flexible container is molded to the contour of the back

Figure 3. Evacuated bag containing polystyrene spheres retains contours of the back

Figure 4. Glass cloth placed on contoured form

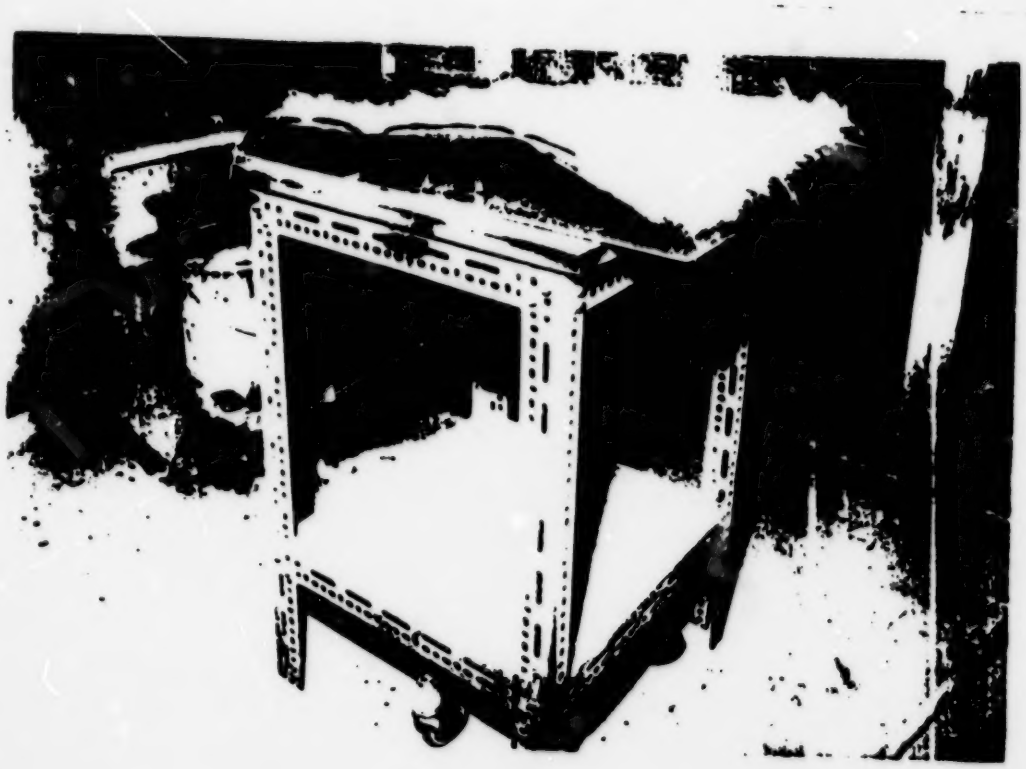


Figure 5. Aluminum foil placed over glass padding in preparation for fibreglassing

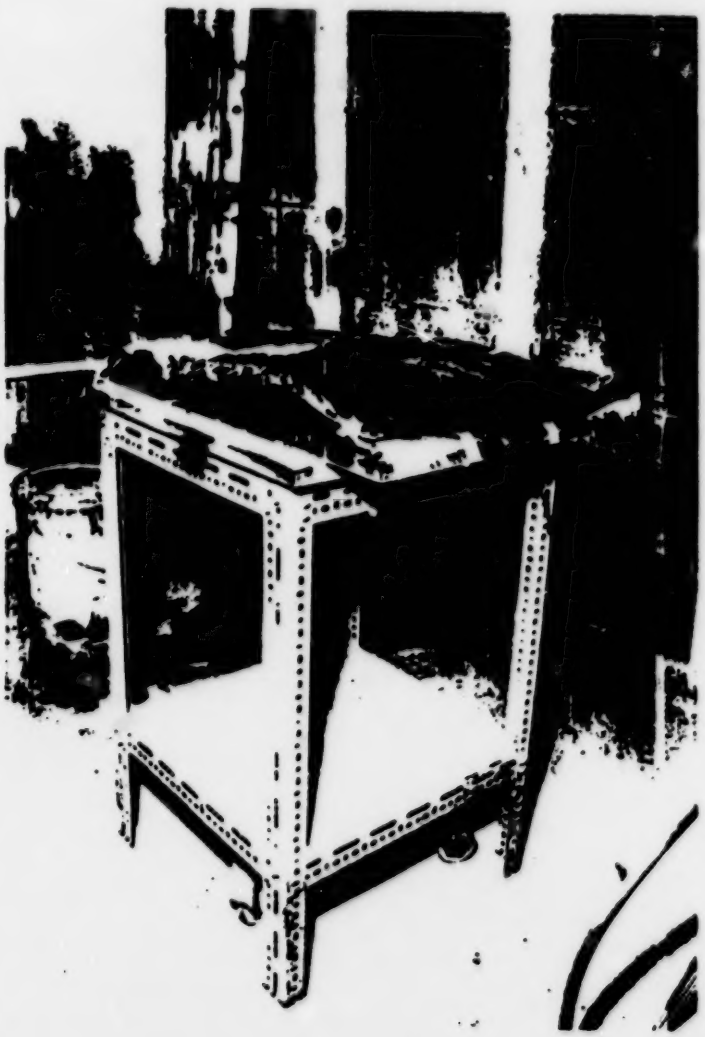


Figure 6. Fibreglassing of lumbar support

Figure 7. Critical area of lumbar support

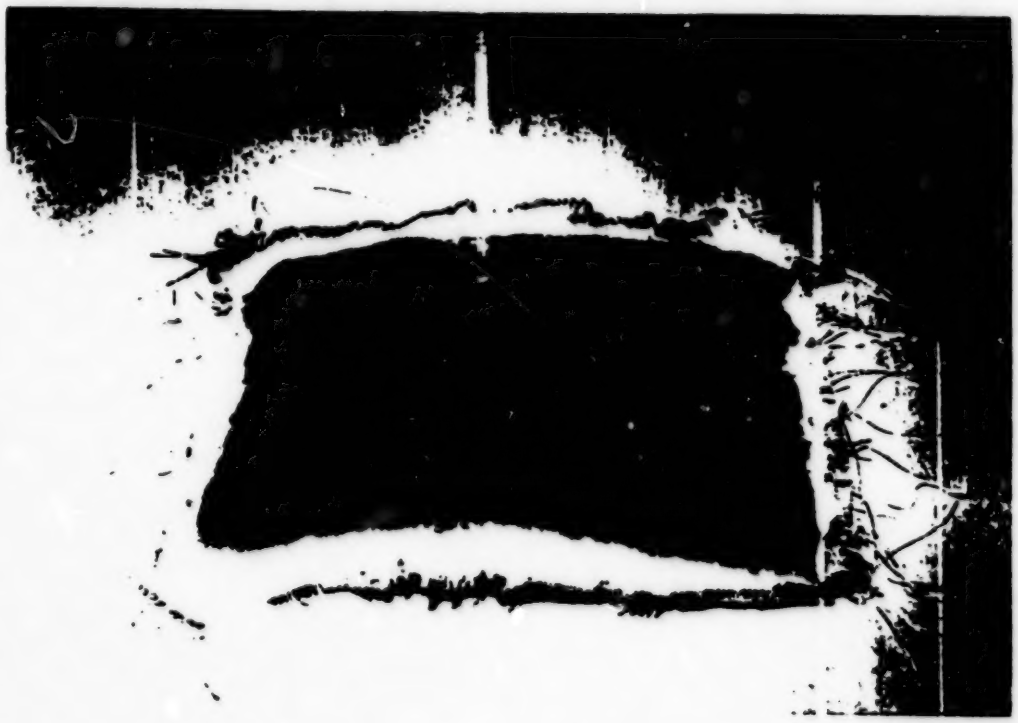


Figure 8. Labelling of lumbar support

Figure 9. Method of attaching webbing

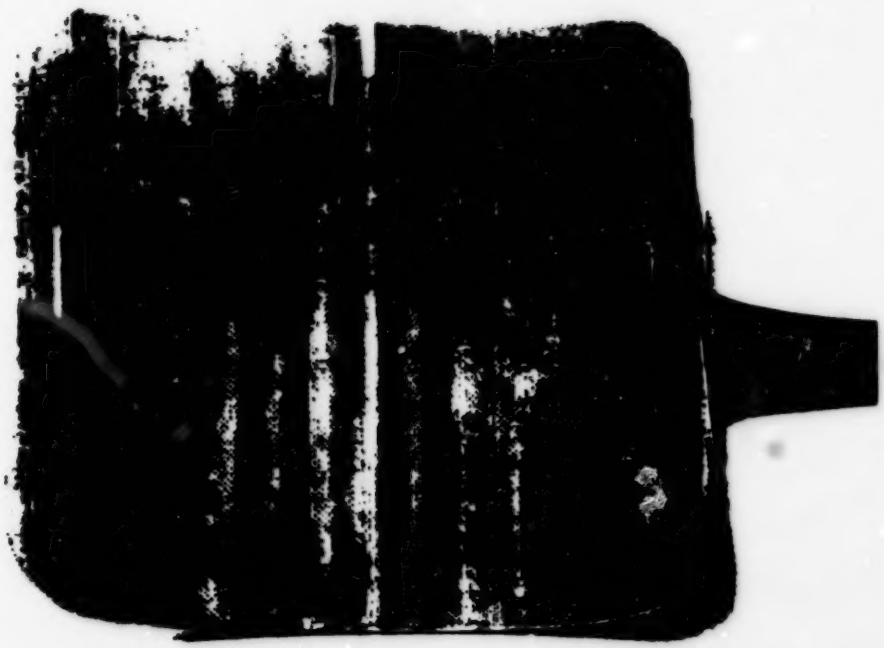


Figure 10. Finished lumbar support-posterior view

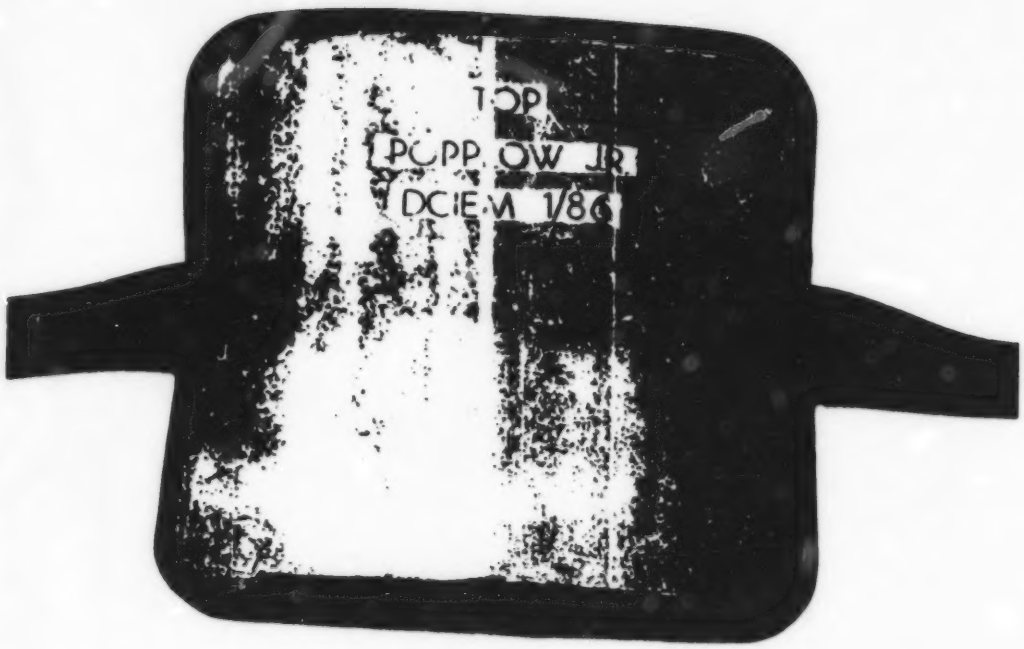


Figure 11. Foam-padded and cloth-covered finished lumbar support
- anterior view -

Figure 12. Sitting Comfort During Flight While Wearing Lumbar Support

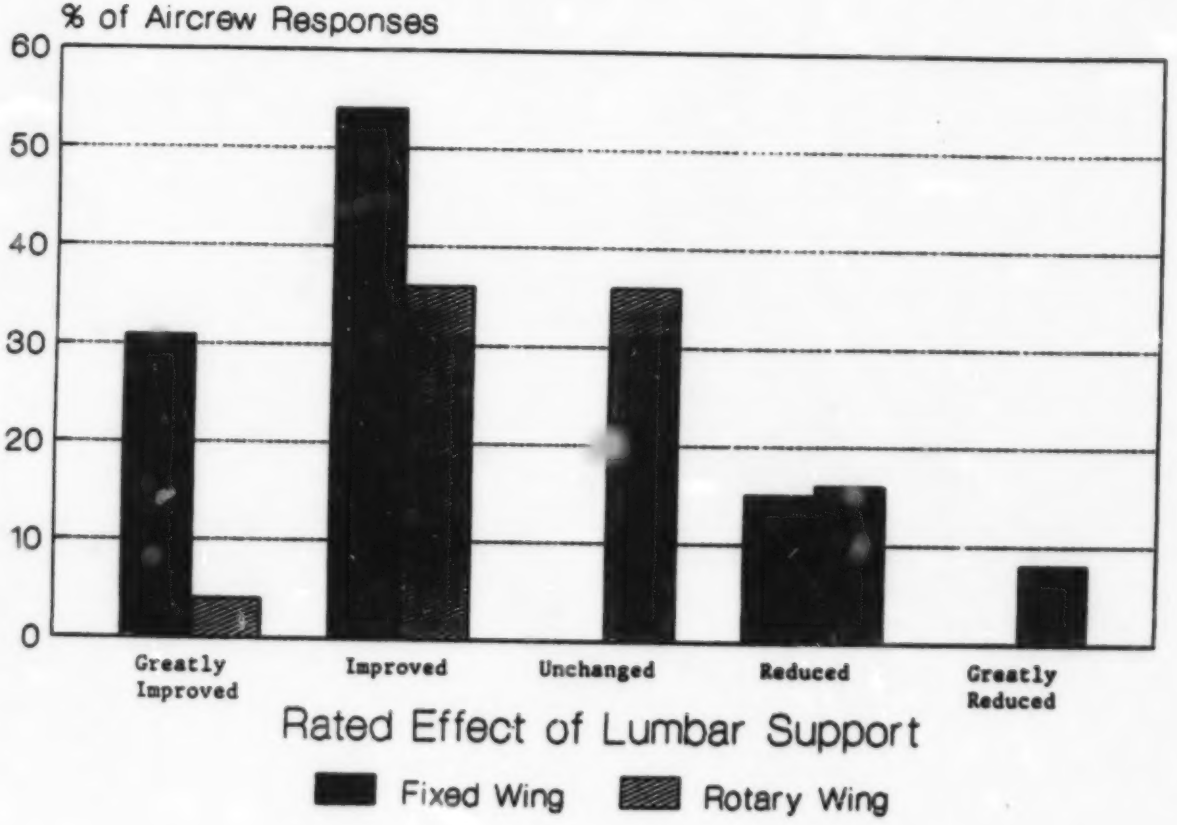


Figure 13. Effect of Wearing Lumbar Support on Backache/Backpain

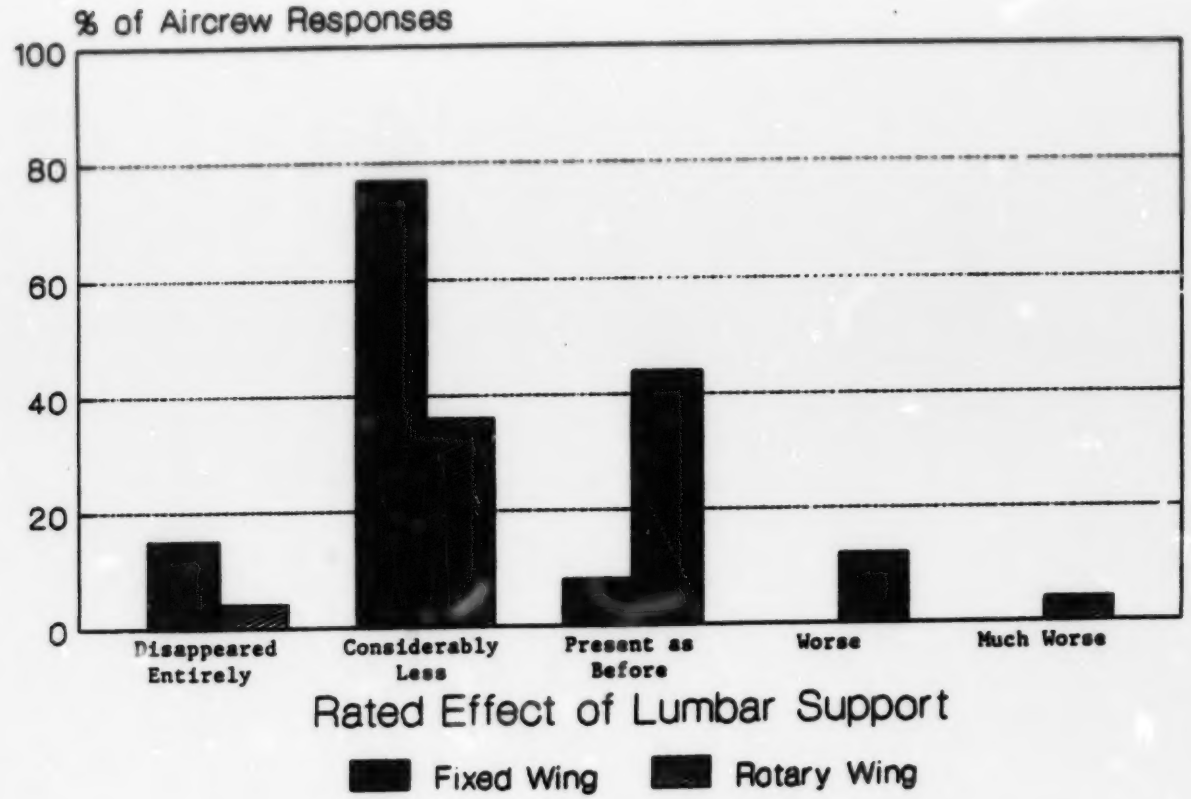
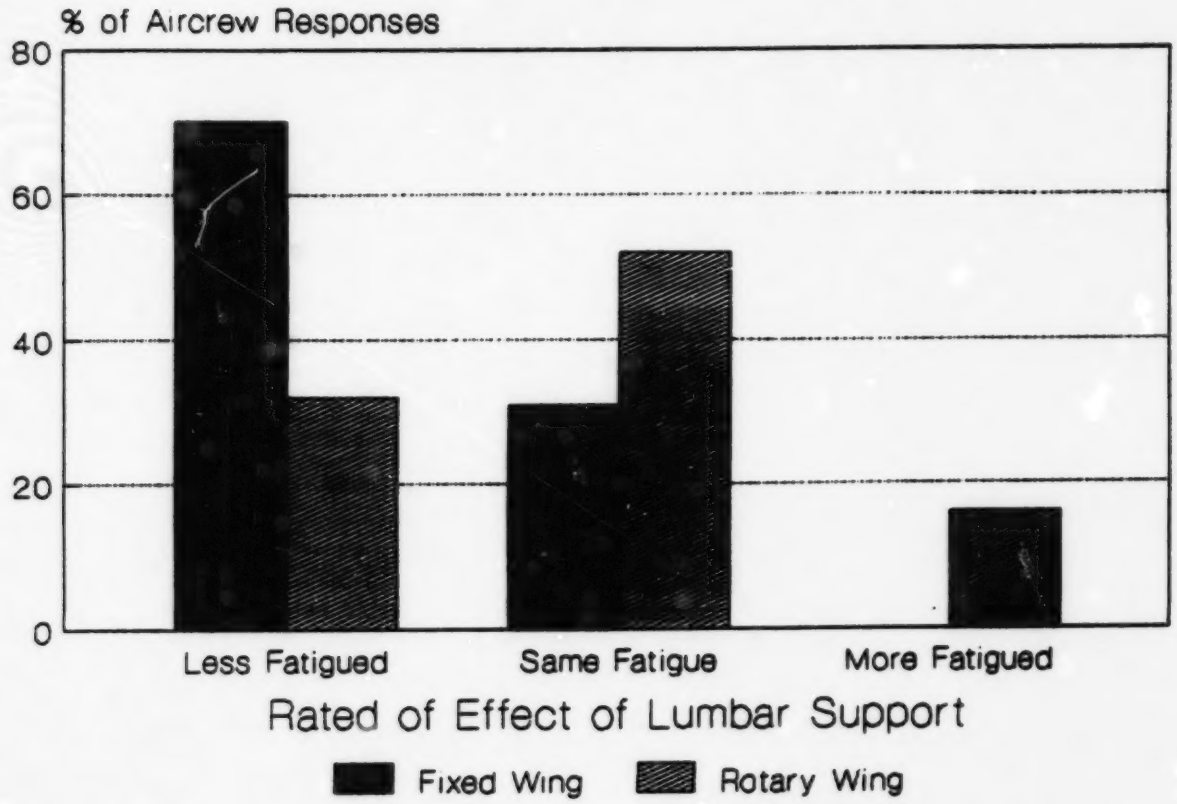


Figure 14. Effect of Wearing Lumbar Support on Post-Mission Fatigue



ANNEX A

INSTRUCTIONS FOR FLIGHT SURGEONS

1. The task of manufacturing prototype individually molded lumbar supports for aircrew has been accepted for 50 aircrew for field evaluation by DCIEM.

2. When a Flight Surgeon considers that an aircrew member is suffering from postural backache and that there are no pathological causes for the complaint, he should refer the aircrew member to DCIEM. If there is any doubt regarding the diagnosis, the advice of a consultant in orthopaedic surgery is to be sought.

3. The Medical Life Support Division (MLSD) at DCIEM will take a mold of the aircrew member's back and manufacture a lumbar support. The aircrew member will be instructed by MLSD in the manner that the support is to be worn. When the manufacture of the support is complete it will be forwarded, together with instructions regarding use and a report form to the aircrew member's Flight Surgeon. The Flight Surgeon is to check that the lumbar support fits the aircrew member and that it is comfortable to wear. He/she is to ensure that the aircrew member receives and understands the instructions provided.

4. The Flight Surgeon is to instruct the aircrew member to report if the backache persists, the lumbar support causes discomfort, or interferes with flight duties. In any case the Flight Surgeon is to see the aircrew member two months after issue of the support. At that time the questionnaire is to be completed and forwarded to DCIEM, Attention: MLSD.

5. Flight Surgeons should note that at least 21 days is required between taking the mold and the production of the support in its final state.

6. If aircrew wearing lumbar supports are involved in any aircraft accident, the fact that a lumbar support was being worn is to be noted clearly on the Board of Inquiry and on the relevant medical documents, if the aircrew member has to be referred to hospital as a result of the accident.

INSTRUCTIONS FOR TRIAL PARTICIPANTS

1. The lumbar support that you have been issued has been individual molded to suit your own particular requirements. It is not interchangeable between aircrew, and must never be worn by anyone other than yourself.

2. Your lumbar support has been manufactured so that it will suit your aircraft seat and aircrew equipment assemblies. Tests have been carried out to ensure that it is compatible with your particular in-flight workspace. If at any time you change to a different aircraft, or use a different aircrew equipment assembly, you should report this fact to your Flight Surgeon.

3. During the fitting procedure you have been instructed on the correct method of wearing your lumbar support. You are reminded that it must be worn beneath the outer layers of the aircrew equipment assembly, (e.g. aircrew coverall, immersion coverall, but if an anti-G suit is worn, it should be fitted outside the G-suit but underneath the winter flying suit). The waistband of the lumbar support should be adjusted when seated to hold the support in the correct position.

4. Considerable benefit may be gained by wearing your lumbar support at other times, particularly when seated for long periods such as on car journeys or at a desk. Ideally, under these circumstances, the lumbar support should be worn beneath the outer garment (jacket or overcoat). However, if this is inconvenient, it is acceptable to wear the support outside the clothing.

ANNEX B

REPORT ON INDIVIDUALLY MOLDED LUMBAR SUPPORT
(To Be Completed By Subject)

Please read the entire questionnaire before completing it. Place a tick in the box opposite the statement that most closely reflects your answer.

1. Name: _____ 2. Rank: _____ 3. MOC: _____

4. Base: _____ Sqn: _____ 5. Aircraft Type: _____

6. Crew Position: _____

7. Frequency of backache/pain when flying before lumbar support issued?
( ) Never
( ) Rare
( ) Occasionally
( ) Frequently
( ) Every Flight

8. Duration of backache/back pain?
( ) Only during the sortie
( ) For up to 4 hrs after sortie
( ) All day after the sortie
( ) For longer than the day of the sortie

9. Number of hours flown since lumbar support issued _____ hour(s).

10. Number of hours flown with lumbar support _____ hour(s).

11. I found that handling and looking after this additional piece of aircrew personal equipment was:
( ) No bother at all ( ) No bother once I got used to it
( ) A bit of a nuisance at first ( ) A nuisance all the time

12. In the aircraft I found that positioning the support:
( ) Took no time at all ( ) Took a minute or more ( ) Took far too long

13. Once correctly positioned I found that the support:
( ) Did not shift ( ) Shifted a little occasionally
( ) Shifted considerably

14. During flight I was:
( ) Unaware of the support ( ) Occasionally aware of the support
( ) Aware of the support to the point of distraction

15. While flying wearing the support my ability to control the aircraft was:
( ) Improved ( ) Unchanged ( ) Diminished

16. During flight my sitting comfort was:
( ) Greatly improved ( ) Improved ( ) Unchanged
( ) Reduced ( ) Greatly reduced

17. While using the support my backache/back pain:
( ) Disappeared entirely ( ) Was considerably less
( ) Was present as before ( ) Was worse ( ) Was much worse

18. After the missions that I had used the support I felt:
( ) Less fatigued than usual ( ) About the Same as usual
( ) More fatigued than usual

19. What improvements or changes, if any, would you like in your lumbar support? Provide any additional comments.

_____
_____
_____
_____

Signed: _____

Name: _____
(Please Print)

Date: _____